

**REMARKS**

**I. STATUS OF THE CLAIMS**

Claims 1, 4, 7-16, 19, 20, 23, 26 and 32-37 are pending and under consideration.

Claims 1, 19 and 33 have been amended. Claims 3 and 22 have been cancelled without prejudice to or disclaimer of the subject matter recited therein.

Claims 1, 12, 19 and 33 are the independent claims.

No new matter is believed to have been added. Reconsideration is respectfully requested.

**II. THE REJECTION UNDER 35 U.S.C. §112**

Claims 1, 3, 4, 6-11, 14, 15, 19, 20, 22, 23, 25, 26 and 32-35 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicants have amended independent claims 1, 19 and 33 and cancelled claims 3 and 33 to correct the minor errors noted by the Examiner.

Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. § 112, second paragraph, of claims 1, 4, 7-11, 19, 20, 23, 26 and 32-35 be withdrawn.

Additionally, Applicants note that claims 6 and 25 were previously cancelled without prejudice or disclaimer of the subject matter recited therein and therefore the rejection of these claims is moot.

Applicants also note that claims 3 and 22 are currently cancelled without prejudice or disclaimer of the subject matter recited therein and therefore the rejection of these claims is also moot.

Finally, Applicants note that claims 14 and 15 were previously amended to correct the minor errors noted by the Examiner and therefore Applicants respectfully request that the rejection under 35 U.S.C. § 112, second paragraph, of claims 14 and 15 be withdrawn.

### III. THE REJECTION UNDER 35 U.S.C. §102 AND §103

Claims 1, 3, 4, 7-16, 19, 20, 22, 23, 26, 32, 33, 36 and 37 are rejected under 35 U.S.C. §102(b)/103(a) as being anticipated by, or alternatively unpatentable over, Evans et al. (US Patent 4,302,520).

Applicants respectfully traverse this rejection for at least the following reasons.

Claims 3 and 22 have been cancelled without prejudice or disclaimer of the subject matter recited therein. Accordingly, the rejection of claims 6 and 25 is moot.

Independent claim 1 recites a lithium-sulfur battery comprising, amongst other novel features, a strong polar solvent comprising one solvent selected from the group consisting of hexamethyl phosphoric triamide,  $\gamma$ -butyrolactone, acetonitrile, ethylene carbonate, propylene carbonate, N-methyl pyrrolidone, dimethyl formamide, sulfolane, dimethyl acetamide, dimethyl sulfoxide, dimethyl sulfate, ethylene glycol diacetate, dimethyl sulfite, and ethylene glycol sulfite.

Independent claim 12 recites a lithium-sulfur battery comprising, amongst other novel features, a strong polar solvent selected from the strong polar solvent group consisting of hexamethyl phosphoric triamide,  $\gamma$ -butyrolactone, acetonitrile, ethylene carbonate, propylene carbonate, N-methyl pyrrolidone, sulfolane, dimethyl sulfate, ethylene glycol diacetate, dimethyl sulfite, and ethylene glycol sulfite.

Independent claim 19 recites an electrolyte for use in a lithium sulfur battery comprising, amongst other novel features, a strong polar solvent comprising one solvent selected from the group consisting of hexamethyl phosphoric triamide,  $\gamma$ -butyrolactone, acetonitrile, ethylene carbonate, propylene carbonate, N-methyl pyrrolidone, dimethyl formamide, sulfolane, dimethyl acetamide, dimethyl sulfoxide, dimethyl sulfate, ethylene glycol diacetate, dimethyl sulfite, and ethylene glycol sulfite.

Independent claim 33 recites a method of manufacturing a lithium-sulfur battery, comprising, amongst other novel features, a strong polar solvent selected from the group consisting of hexamethyl phosphoric triamide,  $\gamma$ -butyrolactone, acetonitrile, ethylene carbonate, propylene carbonate, N-methyl pyrrolidone, dimethyl formamide, sulfolane, dimethyl acetamide, dimethyl sulfoxide, dimethyl sulfate, ethylene glycol diacetate, dimethyl sulfite, and ethylene glycol sulfite.

Regarding the rejection of the claims under 35 U.S.C. §102(b), Applicants note that

Evans discloses a non-aqueous cell utilizing an active metal anode, a cathode and a liquid organic electrolyte such as **3-methyl-2-oxazolidone** in conjunction with a solvent and a selected solute (column 1, lines 7-14). The solvents used by Evans include tetrahydrofuran, methyl-substituted tetrahydrofuran, 1,3 dioxolane; **3-methyl-2-oxazolidone**; propylene carbonate and others (column 4, lines 28-35).

Therefore, although Evans discloses strong and weak solvents, Evans fails to teach or suggest a strong polar solvent selected from the group consisting of hexamethyl phosphoric triamide,  $\gamma$ -butyrolactone, acetonitrile, ethylene carbonate, propylene carbonate, N-methyl pyrrolidone, sulfolane, dimethyl sulfate, ethylene glycol diacetate, dimethyl sulfite, and ethylene glycol sulfite, as recited in independent claims 1, 12, 19 and 33.

Furthermore, independent claims 1 and 12 recite a positive active material comprising at least one sulfur-based compound selected from the group consisting of **elemental sulfur and organosulfur compounds**, and an electrically conductive material. Evans on the other hand teaches a solid cathode material such as  $\text{Bi}_2\text{Fe}_2\text{S}_5$  and  $\text{Bi}_2\text{Pb}_2\text{S}_5$ .

Accordingly, Applicants respectfully assert that the rejection of claims 1, 12, 19 and 33 under 35 U.S.C. § 102(b) should be withdrawn because Evans fails to teach or suggest each feature of the independent claims.

Regarding the rejection of the claims under 35 U.S.C. §103(a), Applicants note that the Office Action recognizes that Evans does not teach a specific example of the claimed mixed organic solvents but nevertheless recites that "the courts have ruled that by the presentation of a Markush group from the strong polar solvents, Applicant has made the representation that for the purpose of the present invention, the elements of the groups are equivalents. Having made this representation, Applicant may not now argue that these two elements are not equivalents"

Applicants respectfully traverse this characterization for at least the following reason.

MPEP 2144.06 under Substituting Equivalents for the Same Purpose recites "In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. *In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958) (**The mere fact that components are claimed as members of a Markush group cannot be relied upon to establish the equivalency of these components.**)

However, an applicant's expressed recognition of an art-recognized or obvious equivalent may be used to refute an argument that such equivalency does not exist.); *In re Scott*, 323 F.2d 1016, 139 USPQ 297 (CCPA 1963).

Therefore, the Examiner cannot rely upon a Markush group to establish obviousness unless Applicants have expressly recognized their equivalency. In the instant case, Applicants have not recognized that 3-methyl-2-oxazolidone (3M20) is equivalent to the remaining strong polar solvents recited in the independent claims. Therefore, Applicants respectfully assert that the rejections under 35 U.S.C. § 103(a) should be withdrawn because Evans fails to teach or suggest each feature of independent claims 1, 12, 19 and 33.

MPEP § 2143.03 instructs that "[t]o establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 409 F.2d 981, 180 USPQ 580 (CCPA 1974)."

Accordingly, Applicants respectfully assert that the rejection of claims 1, 12, 19 and 33 under 35 U.S.C. §103(a) should be withdrawn because Evans fails to teach or suggest each feature of independent claims 1, 12, 19 and 33.

Furthermore, Applicants respectfully assert that dependent claims 4, 7-11, 13-16, 20, 23, 26, 32, 36 and 37 are allowable at least because of their dependence from claims 1, 12, 19 and 33 and because they include additional features which are not taught or suggested by the prior art. Therefore, it is respectfully submitted that claims 4, 7-11, 13-16, 20, 23, 26, 32, 36 and 37 also distinguish over the prior art.

Claims 1, 3, 4, 7-11, 19, 20, 22, 23, 26, 32, 33 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vourlis (US Patent 5,432,030).

Applicants respectfully traverse this rejection for at least the following reasons.

As noted above, claims 3 and 22 have been cancelled without prejudice or disclaimer of the subject matter recited therein. Accordingly, the rejection of claims 6 and 25 is moot.

As also noted above, the Office Action recognizes that Vourlis does not teach a specific example of the claimed strong polar solvent but recites that "the courts have ruled that by the presentation of a Markush group from the strong polar solvents, Applicant has made the representation that for the purpose of the present invention, the elements of the groups are

equivalents. Having made this representation, Applicant may not now argue that these two elements are not equivalents"

As also noted above, Applicants respectfully traverse this rejection for the same reason.

MPEP 2144.06 under Substituting Equivalents for the Same Purpose recites "In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. *In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958) (**The mere fact that components are claimed as members of a Markush group cannot be relied upon to establish the equivalency of these components.** However, an applicant's expressed recognition of an art-recognized or obvious equivalent may be used to refute an argument that such equivalency does not exist.); *In re Scott*, 323 F.2d 1016, 139 USPQ 297 (CCPA 1963).

In the instant case, Applicants have not recognized that 3-methyl-2-oxazolidone (3M20) is equivalent to the remaining strong polar solvents recited in the independent claims.

Furthermore, independent claims 1 and 12 recite a positive active material comprising at least one sulfur-based compound selected from the group consisting of **elemental sulfur and organosulfur compounds**, and an electrically conductive material. Vourlis on the other hand teaches a FeS<sub>2</sub> positive active material which is different from the positive active material recited in independent claims 1 and 12.

Accordingly, Applicants respectfully assert that the rejection of claims 1, 12, 19 and 33 under 35 U.S.C. §103(a) should be withdrawn because Vourlis fails to teach or suggest each feature of independent claims 1, 12, 19 and 33.

Furthermore, Applicants respectfully assert that dependent claims 4, 7-11, 19, 20, 23, 26, 32 and 36 are allowable at least because of their dependence from claims 1, 12, 19 and 33 and because they include additional features which are not taught or suggested by the prior art. Therefore, it is respectfully submitted that claims 4, 7-11, 19, 20, 23, 26, 32 and 36 also distinguish over the prior art.

Claims 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vourlis or Evans in view of Katz et al., (US Patent 6,358,643).

Applicants respectfully traverse this rejection for at least the following reasons.

Claims 34 and 35 depend from independent claim 33.

As noted above, neither Vourlis nor Evans whether taken singly or combined teach or suggest the features of independent claim 33.

Katz discloses a lithium-sulfur battery which includes a negative electrode, a positive electrode and a liquid catholyte including a solvent (abstract). Katz also teaches that the electrolyte may include a co-solvent such as dioxolane (column 3, lines 52-53).

Therefore, although Katz discloses a lithium-sulfur battery comprising a negative electrode, a positive electrode and dioxolane, Katz fails to teach or suggest a strong polar solvent selected from the strong polar solvent group consisting of hexamethyl phosphoric triamide,  $\gamma$ -butyrolactone, acetonitrile, ethylene carbonate, propylene carbonate, N-methyl pyrrolidone, sulfolane, dimethyl sulfate, ethylene glycol diacetate, dimethyl sulfite, and ethylene glycol sulfite, as recited in claim 33.

Accordingly, Katz fails to cure the deficiencies of Vourlis and Evans.

Therefore, Applicants respectfully assert that the rejection of claims 34 and 35 under 35 U.S.C. §103(a) should be withdrawn because neither Vourlis, Evans nor Katz, whether taken singly or combined teach or suggest each feature of independent claim 33 upon which claims 34 and 35 depend.

Furthermore, Applicants respectfully assert that dependent claims 34 and 35 are allowable because they include additional features which are not taught or suggested by the prior art. Therefore, it is respectfully submitted that claims 34 and 35 also distinguish over the prior art.

#### IV. CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

At a minimum, the Board should enter this Amendment at least for purposes of Appeal as it either clarifies and/or narrows the issues for consideration.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 503333.

Respectfully submitted,

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